Mario Baseball Data Analysis

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Load Libraries

```
library(tidyverse)
library(dplyr)
library(knitr)
library(weights)
library(scales)
library(stargazer)
library(ggthemes)
```

Load Data

```
#Load Data
mario_data <- read.csv("Mario_Baseball_Data.csv")

#Clean Data
mario_data <- mario_data %>%
  replace(is.na(.), 0) %>%
  rename(
    date = Date,
    player_name = Player.Name,
    played_game = Games.Played,
    at_bats = AB,
    hits = Hits,
    runs_batted_in = RBI,
    homeruns = HR,
    stolen_bases = SB,
    special_hitting = Special,
    innings_pitched = IP,
    hits_allowed = Hits.1,
    runs_allowed = Runs,
    strikeouts = SO,
    big_plays = Big.Plays,
    special_pitching = Special.1,
    player_type = Player.Type,
    captain = Capitan) %>%
  mutate(date = as.Date(date,"%m.%d.%y"),
         played_game = as.factor(played_game),
         captain = as.factor(captain))
```

Hiting Data Analysis

```
#Add Rate Data to Dataset
mario_data <- mario_data %>%
  group_by(player_name) %>%
  mutate(
    special_use_rate = sum(special_hitting)/sum(at_bats),
    batting_average = sum(hits)/sum(at_bats),
    era = (sum(runs_allowed)/sum(innings_pitched)*9),
    so9 = (sum(strikeouts)/sum(innings_pitched)*9),
    hip = sum(hits_allowed)/sum(innings_pitched))

#By Player Hitting
player_hitting <- mario_data %>%
  group_by(player_name) %>%
  summarise(batting_average = sum(hits)/sum(at_bats),
            special_use_rate = sum(special_hitting)/sum(at_bats))

kable(player_hitting, align = "lcc", col.names = c("Player", "Batting Average", "Special Use Rate"),
      digits = 3)
```

Player	Batting Average	Special Use Rate
Baby Bowser	0.147	0.059
Baby Luigi	0.176	0.059
Baby Mario	0.276	0.000
Birdo	0.343	0.260
Boo	0.343	0.000
Bowser	0.332	0.035
Daisy	0.345	0.152
Diddy Kong	0.053	0.105
DK	0.409	0.100
Drybones	0.286	0.006
Flying Goomba	0.000	0.000
Flying Koopa	0.325	0.007
Goomba	0.316	0.000
Grandpapa Toad	0.438	0.000
Hammer/Etc. Bro	0.380	0.000
King Boo	0.209	0.015
Koopa	0.313	0.010
Luigi	0.336	0.043
Magikoopa	0.218	0.007
Mario	0.454	0.430
Monty	0.194	0.000
Mumbo	0.248	0.000
Noki	0.234	0.065
Peach	0.254	0.099
Petey	0.295	0.000
Shy Guy	0.171	0.000
Toad	0.391	0.000
Toadette	0.211	0.000
Waluigi	0.333	0.190
Wario	0.182	0.091
Yoshi	0.346	0.132

```r
#By Player Type Hitting
player_type_hitting <- mario_data %>%
  group_by(player_type) %>%
  summarise(total_ab = sum(at_bats),
            total_hits = sum(hits),
            total_runs_batted_in = sum(runs_batted_in),
            total_homeruns = sum(homeruns),
            total_sb = sum(stolen_bases),
            batting_average = sum(hits)/sum(at_bats),
            special_use_rate = sum(special_hitting)/sum(at_bats),
            sb_hits = total_sb/total_hits)

kable(player_type_hitting, align = "lcccccccc", col.names = c("Player Type", "Total AB", "Total Hits",
                                                              "Total RBIS", "Total HR", "Total SB",
                                                              "Batting Average", "Special Use", "SB/Hits"),
      caption = "Hitting Stats by Player Type", digits = 3)
```

Table 2: Hitting Stats by Player Type

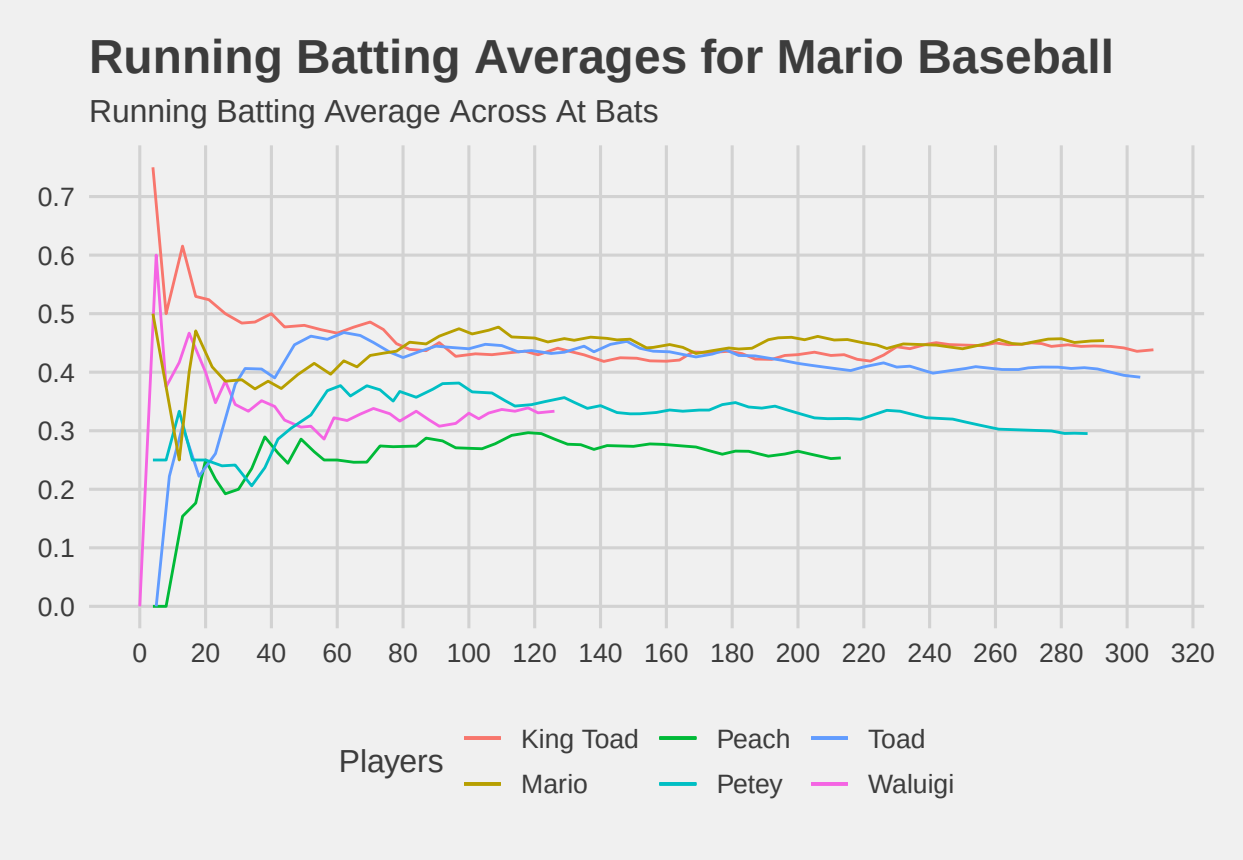
Player Type	Total AB	Total Hits	Total RBIS	Total HR	Total SB	Batting Average	Special Use	SB/Hits
Balance	1798	646	195	6	61	0.359	0.144	0.094
Power	1368	448	181	43	29	0.327	0.031	0.065
Speed	485	136	36	2	17	0.280	0.089	0.125
Technique	1537	504	161	4	41	0.328	0.032	0.081

```r
#By Y/N Captain Hitting
captain_stats <- mario_data %>%
  group_by(captain) %>%
  summarise(batting_average = sum(hits)/sum(at_bats))

kable(captain_stats, align = 'c', col.names = c("Captain Status", "Batting Average"),
      caption = "Are Captains Better Hitters?", digits = 3)
```

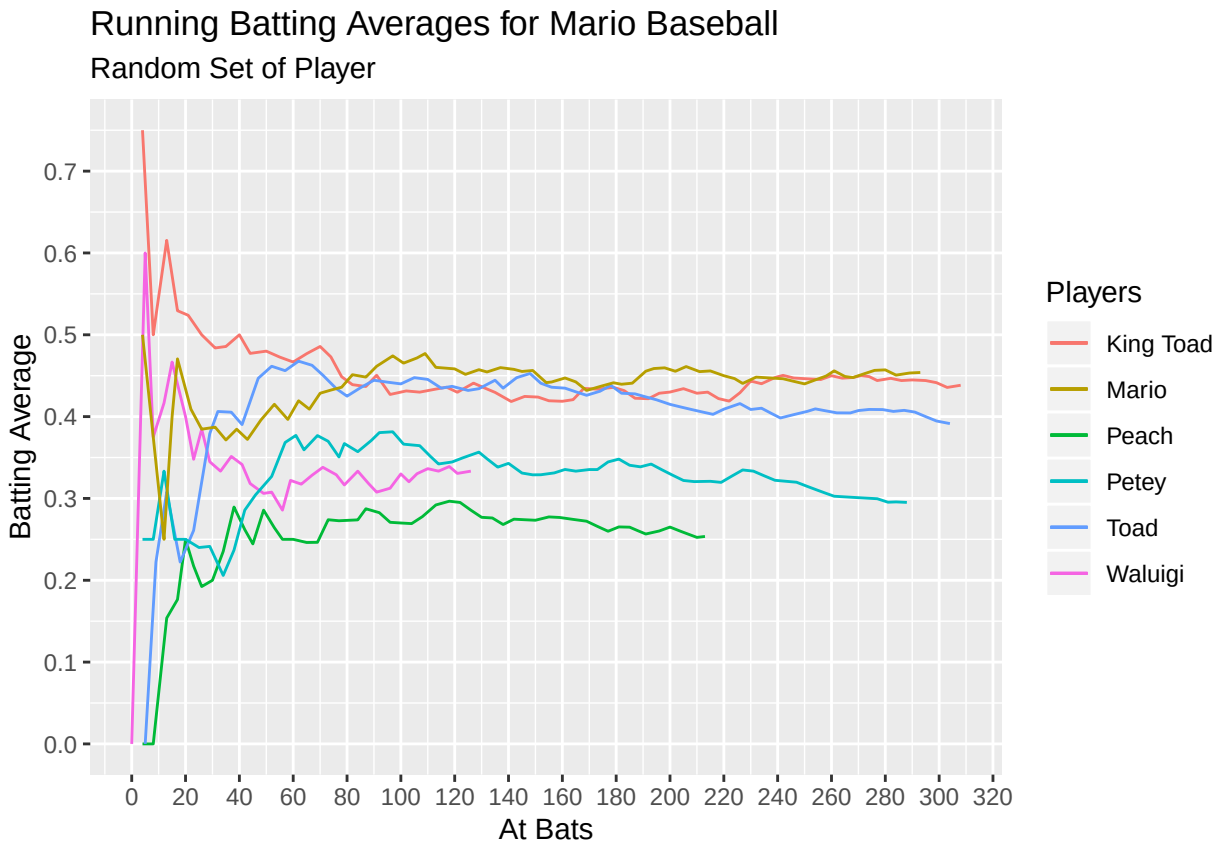
Table 3: Are Captains Better Hitters?

Captain Status	Batting Average
0	0.335
1	0.300

```r
#Running Batting Averages
mario_data <- mario_data %>%
  mutate(
    cum_at_bats = cumsum(at_bats),
    cum_hits = cumsum(hits),
    running_avg = cum_hits / cum_at_bats) %>%
  replace(is.na(.), 0)

#Plot Running Batting Averages
king_toad <- mario_data %>%
  filter(player_name == "Grandpapa Toad")
waluigi <- mario_data %>%
  filter(player_name == "Waluigi")
peach <- mario_data %>%
  filter(player_name == "Peach")
toad <- mario_data %>%
  filter(player_name == "Toad")
petey <-  mario_data %>%
  filter(player_name == "Petey")
mario <-  mario_data %>%
  filter(player_name == "Mario")

#Plot of 6 Players
ggplot() +
  geom_line(king_toad, mapping = aes(x = cum_at_bats,
                                     y = running_avg,
                                     color = "King Toad")) +
  geom_line(waluigi, mapping = aes(x = cum_at_bats,
                                   y = running_avg,
                                   color = "Waluigi")) +
  geom_line(peach, mapping = aes(x = cum_at_bats,
                                 y = running_avg,
                                 color = "Peach")) +
  geom_line(toad, mapping = aes(x = cum_at_bats,
                                y = running_avg,
                                color = "Toad")) +
  geom_line(petey, mapping = aes(x = cum_at_bats,
                                 y = running_avg,
                                 color = "Petey")) +
  geom_line(mario,mapping = aes(x = cum_at_bats,
                                y = running_avg,
                                color = "Mario")) +
  scale_x_continuous(breaks = pretty_breaks(n = 20)) +
  scale_y_continuous(breaks = pretty_breaks(n = 10)) +
  labs(title = "Running Batting Averages for Mario Baseball",
       subtitle = "Running Batting Average Across At Bats",
       x = "At Bats",
       y ="Batting Average") +
  scale_colour_discrete("Players") +
  theme_fivethirtyeight()
```

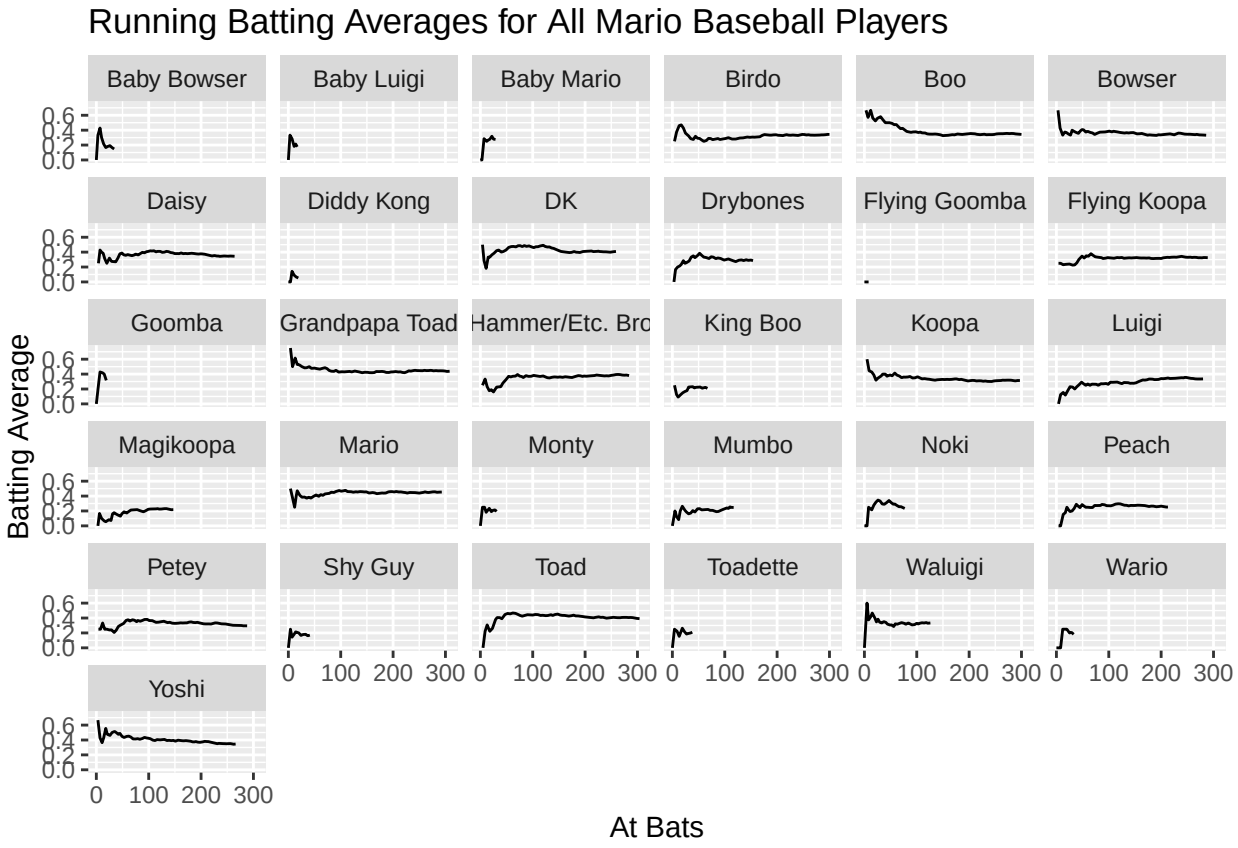



```
ggplot() +
  geom_line(king_toad, mapping = aes(x = cum_at_bats, y = running_avg, color = "King Toad")) +
  geom_line(waluigi, mapping = aes(x = cum_at_bats, y = running_avg, color = "Waluigi")) +
  geom_line(peach, mapping = aes(x = cum_at_bats, y = running_avg, color = "Peach")) +
  geom_line(toad, mapping = aes(x = cum_at_bats, y = running_avg, color = "Toad")) +
  geom_line(petey, mapping = aes(x = cum_at_bats, y = running_avg, color = "Petey")) +
  geom_line(mario, mapping = aes(x = cum_at_bats, y = running_avg, color = "Mario")) +
  scale_x_continuous(breaks = pretty_breaks(n = 20)) +
  scale_y_continuous(breaks = pretty_breaks(n = 10)) +
  labs(title = "Running Batting Averages for Mario Baseball",
       subtitle = "Random Set of Player",
       x = "At Bats",
       y ="Batting Average") +
  scale_color_discrete("Players")
```

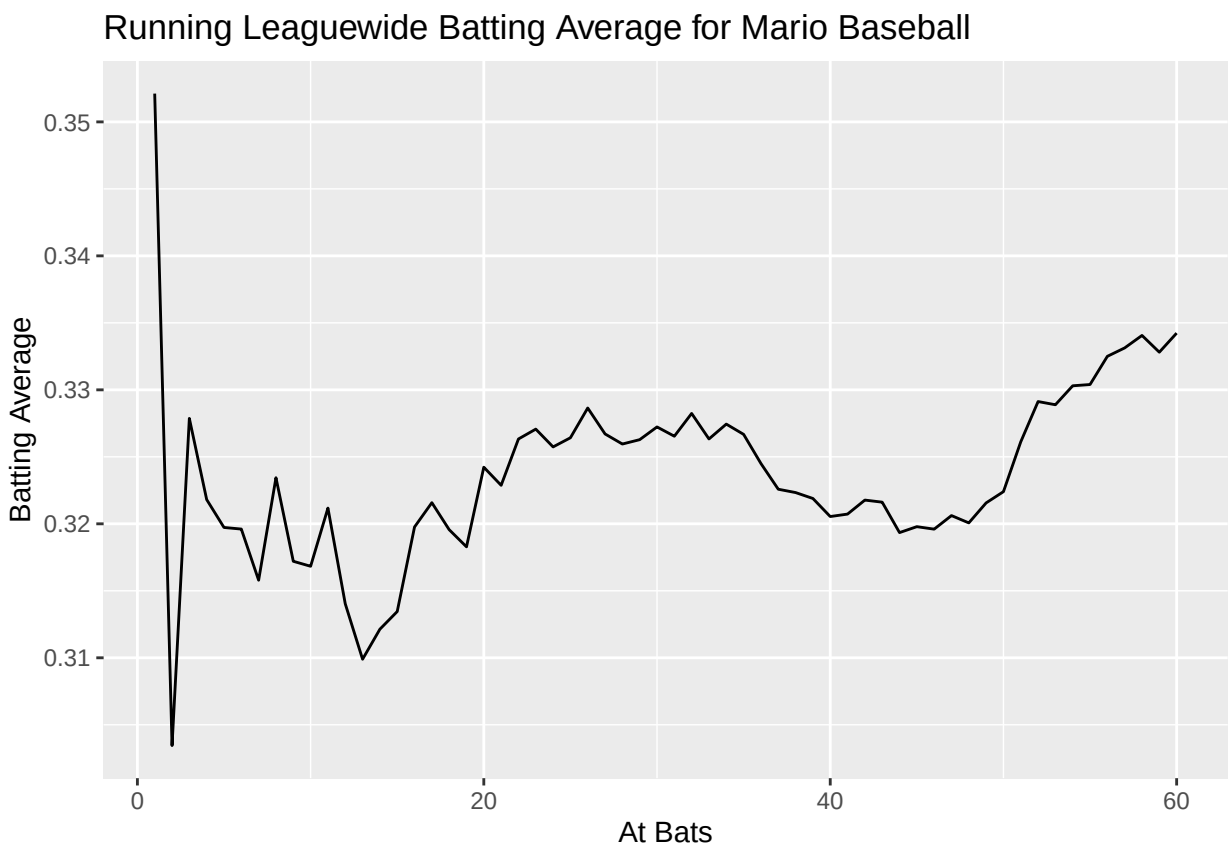



```
# Plot of all Players
ggplot(mario_data, aes(x=cum_at_bats,
                       y=running_avg,
                       group=player_name,
                       shape=player_name)) +
  geom_line() +
  facet_wrap(~ player_name) +
  labs(title = "Running Batting Averages for All Mario Baseball Players",
       x = "At Bats",
       y ="Batting Average")
```

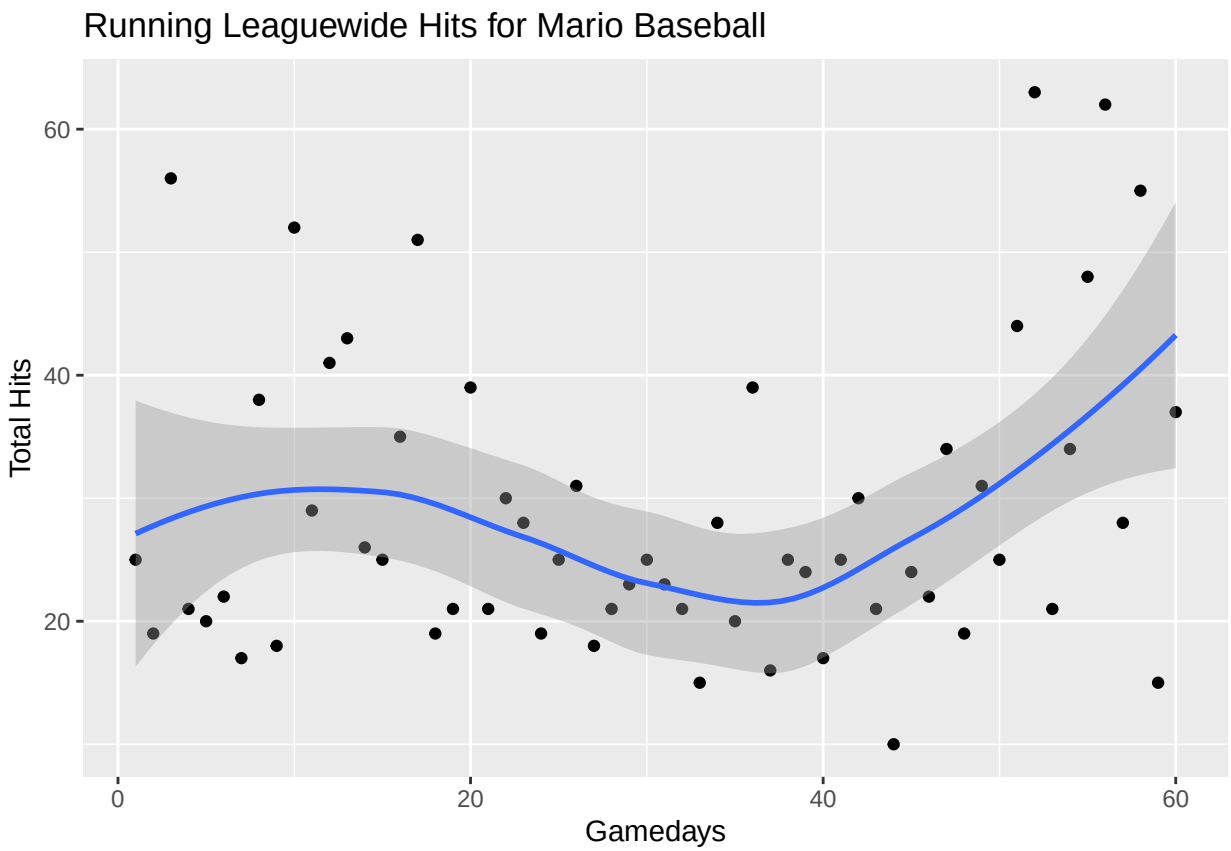
```
## Warning: The shape palette can deal with a maximum of 6 discrete values because
## more than 6 becomes difficult to discriminate; you have 31. Consider
## specifying shapes manually if you must have them.
```


Running Batting Averages for All Mario Baseball Players
Baby Bowser
Baby Luigi
Baby Mario
Birdo
Boo
Bowser
Daisy
Diddy Kong
DK
Drybones
Flying Goomba
Flying Koopa
Goomba
Grandpapa Toad
Hammer/Etc. Bro
King Boo
Koopa
Luigi
Magikoopa
Mario
Monty
Mumbo
Noki
Peach
Petey
Shy Guy
Toad
Toadette
Waluigi
Wario
Yoshi
Batting Average
0.6
0.4
0.2
0.0
0
100
200
300
At Bats

```r
#Leagewide running average
leaguewide_data <- mario_data %>%
  group_by(date) %>%
  summarise(
    total_hits = sum(hits),
    total_at_bats = sum(at_bats),
    total_average = sum(total_hits)/sum(total_at_bats)) %>%
  mutate(
    gameday = row_number(),
    cum_at_bats = cumsum(total_at_bats),
    cum_hits = cumsum(total_hits),
    running_avg = cum_hits / cum_at_bats)



#Leaguewide Average Plot
ggplot() +
  geom_line(leaguewide_data, mapping = aes(x=gameday, y=running_avg)) +
  labs(title = "Running Leaguewide Batting Average for Mario Baseball",
       x = "At Bats",
       y ="Batting Average")
```



```r
#Leaguewide Hits plot
ggplot(leaguewide_data, mapping = aes(x=gameday, y=total_hits)) +
  geom_point() +
  geom_smooth(method = "loess") +
    labs(title = "Running Leaguewide Hits for Mario Baseball",
       x = "Gamedays",
       y ="Total Hits")
```



```r
#Sample Regression
batting_avg_captain <- lm(batting_average ~ player_type + special_use_rate + captain ,
                      data = mario_data)

stargazer(batting_avg_captain,
          type = "latex", header = FALSE,
          title = "Regression of Batting Average on Player Type with Controls",
          intercept.bottom = FALSE, single.row=TRUE)
```

Table 4: Regression of Batting Average on Player Type with Controls

	Dependent variable:
	batting_average
Constant	0.306^{***} (0.004)
player_typePower	-0.040^{***} (0.005)
player_typeSpeed	-0.131^{***} (0.005)
player_typeTechnique	-0.003 (0.005)
special_use_rate	0.253^{***} (0.020)
captain1	-0.011 (0.017)
Observations	2,170
R^2	0.354
Adjusted R^2	0.353
Residual Std. Error	0.083 (df = 2164)
F Statistic	237.401^{***} (df = 5; 2164)
Note:	*p<0.1; **p<0.05; ***p<0.01

Pitching Data Analysis

```
#Player Pitching
player_era_1 <- mario_data %>%
  filter(sum(innings_pitched) >= 40) %>%
  group_by(player_name) %>%
  summarise(era = (sum(runs_allowed)/sum(innings_pitched)*9))

kable(player_era_1, align = "lc", col.names = c("Player", "ERA"),
      caption = "ERA for pitchers with 40+ Innings Pitched",
      digits = 3)
```

Table 5: ERA for pitchers with 40+ Innings Pitched

Player	ERA
Boo	4.388
Flying Koopa	4.130
Koopa	3.207
Waluigi	4.750

```
player_era_2 <- mario_data %>%
  filter(sum(innings_pitched) >= 10 & sum(innings_pitched) < 40) %>%
  group_by(player_name) %>%
  summarise(era = (sum(runs_allowed)/sum(innings_pitched)*9))

kable(player_era_2, align = "lc", col.names = c("Player", "ERA"),
      caption = "ERA for pitchers with 10-40 Innings Pitched",
      digits = 3)
```

Table 6: ERA for pitchers with 10-40 Innings Pitched

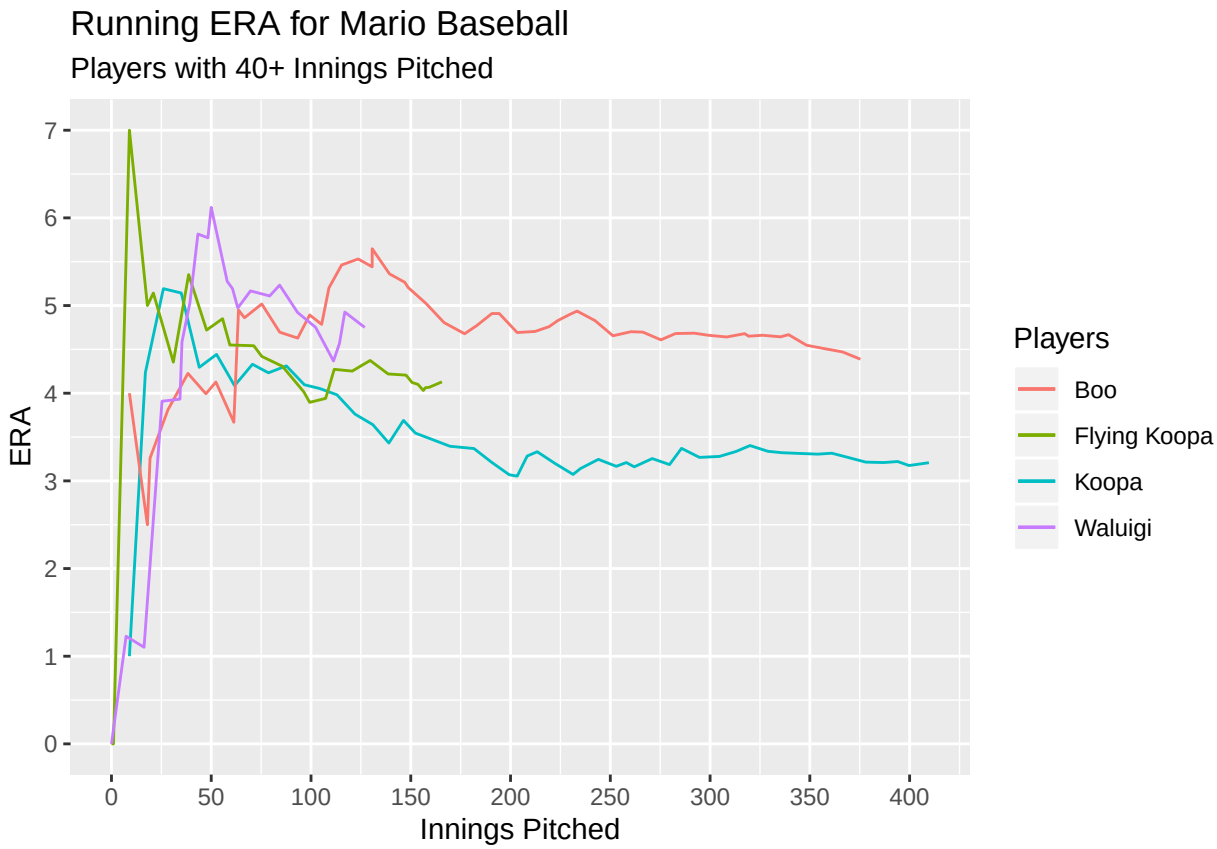
Player	ERA
Baby Luigi	3.378
Daisy	4.670
Diddy Kong	2.544
DK	7.200
Peach	6.752
Toad	4.627

```r
#Player Type Pitching
player_type_pitching <- mario_data %>%
  group_by(player_type) %>%
  summarise(
    total_innings = sum(innings_pitched),
    era = (sum(runs_allowed)/sum(innings_pitched)*9),
    total_strikeouts = sum(strikeouts),
    total_big_plays = sum(big_plays))

kable(player_type_pitching, align = "lcccc",
      col.names = c("Player Type", "Innings", "ERA", "Strikeouts", "Big Plays"),
      caption = "Pitching and Fielding Stats by Player Type",
      digits = 3)
```

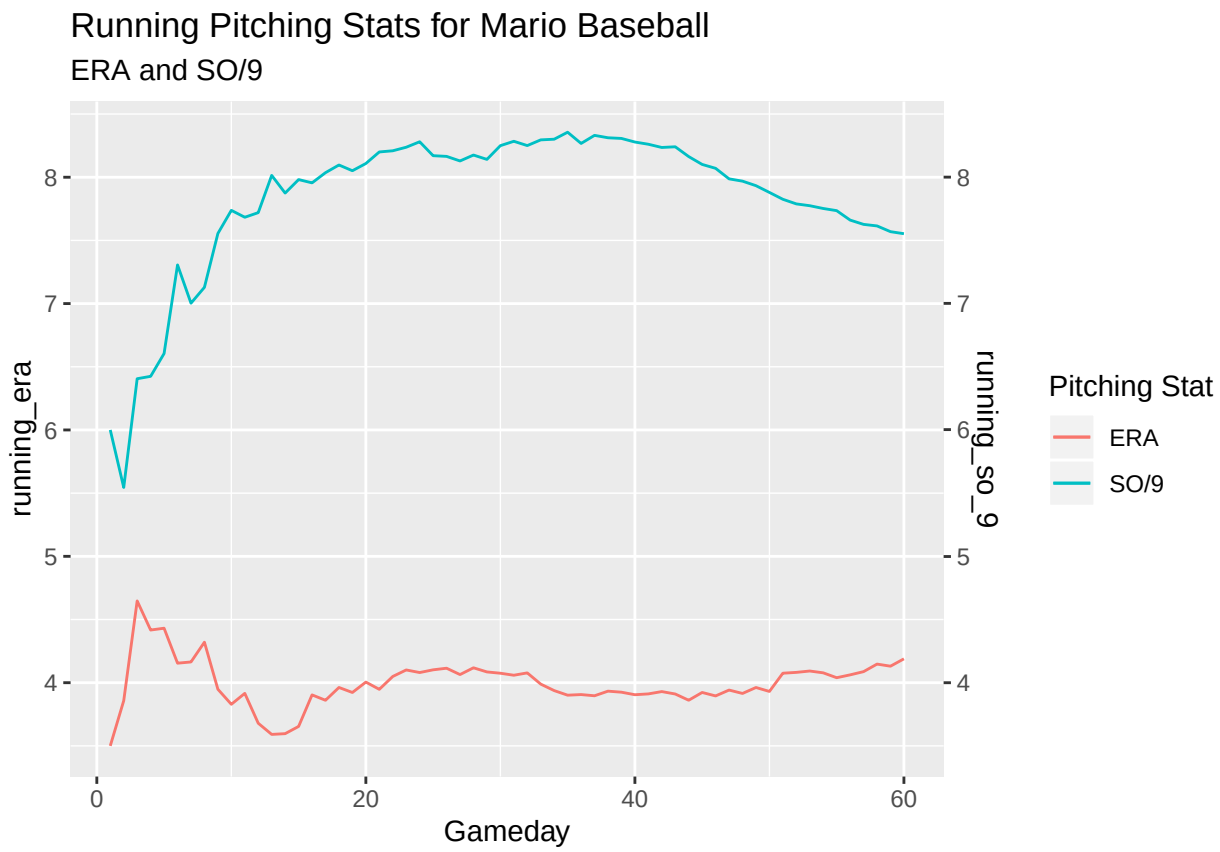
Table 7: Pitching and Fielding Stats by Player Type

Player Type	Innings	ERA	Strikeouts	Big Plays
Balance	460.597	3.556	407	146
Power	34.650	9.091	25	81
Speed	71.600	3.142	42	41
Technique	687.890	4.475	579	62

```r
#Running Pitching Stats
mario_data <- mario_data %>%
  mutate(
    cum_runs_allowed = cumsum(runs_allowed),
    cum_innings = cumsum(innings_pitched),
    running_era = (cum_runs_allowed / cum_innings)*9) %>%
  replace(is.na(.), 0)

waluigi <- mario_data %>%
  filter(player_name == "Waluigi")

flying_koopa <- mario_data %>%
  filter(player_name == "Flying Koopa")

koopa <- mario_data %>%
  filter(player_name == "Koopa")

boo <- mario_data %>%
  filter(player_name == "Boo")

#Plot Running Pitching
ggplot() +
  geom_line(koopa, mapping = aes(x = cum_innings, y = running_era, color = "Koopa")) +
  geom_line(boo, mapping = aes(x = cum_innings, y = running_era, color = "Boo")) +
  geom_line(flying_koopa, mapping = aes(x = cum_innings, y = running_era, color = "Flying Koopa")) +
  geom_line(waluigi, mapping = aes(x = cum_innings, y = running_era, color = "Waluigi")) +
  scale_x_continuous(breaks = scales::pretty_breaks(n = 10)) +
  scale_y_continuous(breaks = scales::pretty_breaks(n = 10)) +
  labs(title = "Running ERA for Mario Baseball",
       subtitle = "Players with 40+ Innings Pitched",
       x = "Innings Pitched",
       y ="ERA") +
  scale_colour_discrete("Players")
```


Running ERA for Mario Baseball
Players with 40+ Innings Pitched
ERA
Innings Pitched
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300
350
400
Players
Boo
Flying Koopa
Koopa
Waluigi

```r
#Leaguewide Pitching
leaguewide_pitching <- mario_data %>%
  group_by(date) %>%
  summarise(
    total_innings = sum(innings_pitched),
    total_hits_allowed = sum(hits_allowed),
    total_runs_allowed = sum(runs_allowed),
    total_strikeouts = sum(strikeouts),
    total_era = ((sum(runs_allowed)/sum(innings_pitched))*9)
    ) %>%
  mutate(
    gameday = row_number(),
    cum_innings = cumsum(total_innings),
    cum_runs_allowed = cumsum(total_runs_allowed),
    cum_strikeouts = cumsum(total_strikeouts),
    running_so_9 = ((cum_strikeouts/cum_innings)*9),
    running_era = ((cum_runs_allowed / cum_innings)*9))


#Leaguewide ERA Plot
ggplot() +
  geom_line(leaguewide_pitching, mapping = aes(x=gameday,
                                               y=running_era,
                                               color = "ERA")) +
  geom_line(leaguewide_pitching, mapping = aes(x=gameday,
                                               y=running_so_9,
                                               color = "SO/9")) +
  scale_y_continuous("running_era", sec.axis = sec_axis(~ . * 1, name = "running_so_9")) +
  labs(title = "Running Pitching Stats for Mario Baseball",
       subtitle = "ERA and SO/9",
       x = "Gameday") +
    scale_colour_discrete("Pitching Stat")
```




```
write.csv(mario_data,'Mario_Baseball_Data_update.csv')
write.csv(leaguewide_data,'leaguewide_data.csv')
```